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09/125,128 08/11/98 IGUCHI

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EXAMINER

CLEVELAND, M

ART UNIT

PAPER NUMBER

1762

DATE MAILED:

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06/21/00

**Please find below and/or attached an Office communication concerning this application or proceeding.**

**Commissioner of Patents and Trademarks**

9.

## Office Action Summary

Application No.

09/125,128

Applicant(s)

Iguchi et al.

Examiner

Michael Cleveland

Group Art Unit

1762

☒ Responsive to communication(s) filed on Apr 7, 2000

☐ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 35 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

### Disposition of Claim

☒ Claim(s) 1-41 and 43-58 is/are pending in the applicat

Of the above, claim(s) \_\_\_\_\_ is/are withdrawn from consideration

☐ Claim(s) \_\_\_\_\_ is/are allowed.

☒ Claim(s) 1-41 and 43-58 is/are rejected.

☐ Claim(s) \_\_\_\_\_ is/are objected to.

☐ Claims \_\_\_\_\_ are subject to restriction or election requirement.

### Application Papers

☒ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on \_\_\_\_\_ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some\* ☒ None of the CERTIFIED copies of the priority documents have been  
☐ received.

☐ received in Application No. (Series Code/Serial Number) \_\_\_\_\_

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\*Certified copies not received: \_\_\_\_\_

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

### Attachment(s)

☐ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). \_\_\_\_\_

☐ Interview Summary, PTO-413

☒ Notice of Draftsperson's Patent Drawing Review, PTO-948 ✓

☐ Notice of Informal Patent Application, PTO-152

— SEE OFFICE ACTION ON THE FOLLOWING PAGES —

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## DETAILED ACTION

### *Response to Arguments*

1. Applicant argues that EP 0806786A1 does not qualify as prior art against the claims in the present application because they find support in the foreign priority documents, translations of which were submitted as Paper No. 8 on 4/7/00. The Examiner has applied the U.S. equivalent of the EP patent above, U.S. Patent 5,921,836, which has a filing date of Jan. 27, 1997. Thus, '836 qualifies as prior art against all material except that which was present in Japanese Application 8/336713 with a filing date of Dec. 17, 1996. The Examiner finds that the material of current claims 1-3, 5-6, 11, 16, 20, 22, and 27-29 finds support in the above mentioned application, and that therefore '836 does not qualify as prior art against those claims. '836 does qualify as prior art against the remainder of the claims. A new action follows.

### *Claim Rejections - 35 USC § 112*

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 34-36, 44, and 47 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Apparatus claims must depend only on the characteristics of the apparatus and not on the intended use of the apparatus. Thus, claims 34-36 and 44 are vague and indefinite because, if the claims were granted, infringement would necessarily be determined in part by the features of the substrate and/or intended use of the apparatus.

Claim 47: The scope of the final clause "... and the outlet holes corresponding...almost on a straight line." is not clear to the Examiner. How are the holes "arranged cyclically"? What does "almost on a straight line" mean? <sup>me</sup> As far as the Examiner understands the claim, it appears that if three adjacent nozzles of the form of '836 Figs. 15 and 16 were used simultaneously to

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provide all of the coating stripes, that the resulting staggered nozzle formation would read on the limitations “arranged cyclically” and “almost in a straight line”. (See below.)

4. Claims 1-41 and 43-58 are objected to because of the following informalities: In claim 21, “powders” should apparently be “pastes”. “relatively” should be replaced by “relative to” in several claims. The claims appear to be a literal translation into English from a foreign document. Many would benefit from clarification by revising them in proper idiomatic English (Particular examples include claims 13, 16, 20, and 47.)

***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

6. Claims 1-2, 4, 9, 16, 22, and 31-32 are rejected under 35 U.S.C. 102(e) as being anticipated by Shinoda et al. (U.S. Patent 5,674,553, hereafter ‘553).

‘553 teaches a method of applying a phosphor paste containing a phosphor powder and an organic solvent through a plurality of outlet holes onto a substrate with a plurality of barrier ribs to form a phosphor layer (col. 19, line 66-col. 20, line 7 and Figs. 22A-C). Three pastes may be used to form red, green, and blue stripes. The pastes are then heated to form the phosphor layers (col. 20, line 35-48).

Claim 4: A screen printer is a paste applicator with a plurality of holes in a flat substrate.

Claim 9: The openings are formed at a pitch triple that of the ribs (col. 19, lines 61-65).

Claim 16: The phosphors are applied consecutively and dried (col. 20, lines 36-48).

Claim 22: The paste may include a cellulose resin (col. 20, lines 5-7).

Claim 31: The ribs may be black on top (col. 12, lines 59-64).

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Claim 32: '553 teaches that the desired phosphor film thickness is preferably from 10-50 microns. While there is no teaching regarding the ratio of the thickness of the layer on the bottom (T1) and the side wall (T2), any values independently chosen from the range necessarily produce a ratio of  $0.2 \leq T1/T2 \leq 5$ .

7. Claims 4, 7, 9, 12, 17, and 31 are rejected under 35 U.S.C. 102(e) as being anticipated by Nanto et al. (U.S. Patent 5,921,836, hereafter '836).

'836 teaches a method of forming a plasma display panel using a paste applicator with a plurality of nozzles (and therefore a plurality of holes) to deposit a phosphor paste including an organic binder to form a phosphor layer on a substrate with a plurality of barrier ribs (col. 4, lines 16-39). The phosphors may be of three colors (red, green, and blue), applied as stripes, and dried (col. 1, line 58-col. 2, line 12).

Claim 4: The applicator holes may be formed as nozzles (col. 4, lines 26-39).

Claim 7: There may be 5 nozzles (col. 4, lines 26-39).

Claim 9: The hole pitch may be six times the barrier pitch (col. 11, lines 45-53).

Claim 12: The clearance (distance between the nozzle tips and barrier top) should be kept constant. Typical values are 0.1-0.2 mm (col. 6, lines 3-13).

Claim 17: The substrate and nozzle may be moved parallel to each other (col. 4, lines 49-53).

Claim 31: The top of the ribs may be colored black (col. 5, line 59-col. 6, line 2).

### ***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

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having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 3, 5-7, 11, 21, 26, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over '553.

'553 does not teach Applicant's specifically claimed ranges of the number of outlet holes, the spacing between barrier ribs, the diameter of the outlet holes, the paste composition, the barrier rib characteristics, and phosphor layer thickness.

Claim 30: The width and pitch of the ribs control the resolution of the display panel. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have optimized them for the desired resolution. '553 explicitly teaches a barrier pitch of 220 microns, widths of 40-80 microns (col. 19, lines 49-60) and height of 100 microns (col. 19, line 8-17).

Claims 3 and 11: As described above, '553 teaches a pitch of 220 microns. Also, the electrode width is taught to be 60-70 microns. In such an embodiment, the spacing between ribs must be greater than 60 microns but less than 220. '553 teaches that it is undesired to deposit the phosphor paste on top of the barriers. Thus, the outlet holes should be smaller than the pitch. '553 teaches that screen with hole openings of 60 microns may be used to print other pastes (col. 19, lines 49-60). One of ordinary skill in the art would have expected to be able to use such a screen to print a phosphor paste with the expectation of success. In such a case, the diameter of the holes would be less than the spacing between the ribs. Both would be between 10 and 500 microns.

Claims 5-7: The number of holes depends on the size of the panel to be coated. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have determined the desired number of holes prior to coating.

Claim 21: The phosphor paste should contain 10-50 wt. % phosphor and may contain a resin binder and organic solvent. The relative concentrations of the thickener and solvent will necessarily affect the viscosity of the paste (and therefore the printing effectiveness) and the

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necessary drying time. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have optimized the concentrations of the phosphor, binder, and solvent to control the rheological properties and drying time of the process.

Claim 26: The phosphor height, width, and pitch and phosphor concentration are all result-effective variables, as discussed above. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have optimized the parameters to have controlled the resolution and rheological properties.

10. Claims 20 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over '553 as applied to claims 1 and 2 above, and further in view of Osaka et al. (U.S. Patent 5,277,840, hereafter '840).

'553 does not teach Applicant's specifically claimed ranges of the grain size, specific surface area, or paste viscosity.

'840 teaches that the particle size and viscosity of phosphor pastes are known to affect the light-emitting characteristics and resolution (col. 3, lines 8-39 and Abstract). The size distribution necessarily affects the specific surface area. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to have optimized the size distribution, specific surface area and paste viscosity of '553 for the best light-emitting characteristics and resolution.

11. Claims 28 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over '553 as applied to claims 1 and 2 above, and further in view of Yamaura et al. (U.S. Patent 4,680,231, hereafter '231).

'553 does not teach the use of a photosensitive component in the phosphor paste. '231 teaches that phosphor pastes may include photosensitive components in order to perform further photolithographic processing. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to have included a photosensitive component in the phosphor paste of '553 in order to make the process more flexible by allowing further patterning by

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photolithography (for example, to remove, undesired material from the tops of the barrier ribs) (Abstract, col. 6, line 42-col. 7, line 10).

12. Claims 8, 13-15, 19, 21, 26, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over '836.

'836 does not explicitly teach Applicant's claimed multiple paste applicators, order of application, or ranges of the outlet hole pitch, phosphor paste compositions, barrier rib characteristics, and spacing between stripes.

Claims 8, 13, 21, 26, and 30: The resolution is affected by variables such as the distance between stripes of different colors, barrier height, width, and pitch. The viscosity of the paste is affected by the composition of the paste (col. 4, lines 16-20, col. 7, line 66-col. 8, line 19). The outlet hole pitch is determined by the rib pitch (col. 11, lines 41-59). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have optimized these characteristics for the desired resolution and paste thickness.

Claims 14-15: In the embodiment of Fig. 18, the pastes are applied in opposite directions. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have applied them both simultaneously with independent applicators and at the same speed to reduce the total processing time.

Claim 19: The coating process begins outside of the region of effective display (col. 6, lines 35-41), apparently so that nonuniformities during the beginning of the deposition are not seen in the final product. By extension, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have continued movement beyond the effective region at the end of each stripe as well to prevent nonuniformities at the end of the process. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have begun moving the nozzle before deposition and stopped after deposition ceased in order to avoid nonuniformities in the effective region of the display panel.



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13. Claims 10, 33-41, 43-44, 47-49, 51-56, and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over '836 as applied to claims 1-2 above, and further in view of Ravi-Chandar et al. (U.S. Patent 5,656,574, hereafter '574).

'836 teaches the method of claims 1 and 2 as described above. '836 teaches an apparatus comprising a platform for fixing the substrate, a paste applicator with a plurality of holes, a supply means for supplying the paste to the applicator and a moving means to move the platform substrate and applicator relative to each other (col. 4, lines 8-56). '836 does not describe the use of outlet holes with a length/diameter ratio of 0.1-600.

The Examiner takes official notice that the length to diameter ratio of a nozzle for dispensing pastes is known to affect the rheological properties and therefore the dispensing efficiency of the nozzle. See, for instance, the extrusion process described in '574, col. 6, lines 40-49. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have optimized the length-to-diameter ratio of the paste applicator of '836 for the optimum rheological properties.

Claims 34-35: '836 suggests using a substrate with a spacing S of 170 microns and D of 100 microns (col. 4, lines 36-39). The shape of the holes is a design choice. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a non-circular nozzle with the expectation of similar results.

Claim 36: The hole pitch may be six times the barrier pitch (col. 11, lines 45-53).

Claims 37-38: Figs. 15 and 16 suggest that the outlet holes are on the same plane and identical in form.

Claims 39-40: '836 suggests using 5-30 nozzles (col. 4, lines 34-37).

Claim 41: The hole pitch is determined by the pitch between the ribs, which is itself a cause-effective variable (col. 11, lines 45-53).

Claim 43: '836 suggests a hole diameter of 100 microns (col. 4, lines 30-34).

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Claim 44: '836 teaches that the apparatus has sensors to detect the ribs and to adjust the substrate accordingly (col. 7, lines 8-32). Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to have positioned the nozzles above the centers of the grooves in order to evenly distribute the phosphor onto the barrier walls.

Claims 47 and 49: Figs. 16 and 22 suggest a distribution system in which one storage section is used to dispensed paste to multiple nozzles. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used multiple nozzles to distribute the multiple phosphors simultaneously in order to reduce the processing times. In such an embodiment, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have three staggered sets of nozzles, each set with its own distribution system to supply different colored phosphors in order to reduce the processing time by applying all the stripes simultaneously.

Claims 48 and 58: Multiple applicators may be provided to apply the phosphors in series (Fig. 13).

Claim 51: The apparatus may have means to detect the position of the tips of the outlet holes and the tops of the barrier ribs (col. 6, lines 3-20) and controlling the area of application (col. 6, lines 3-50).

Claim 52: The distance between the ribs and nozzle tips is kept constant (col. 6, lines 3-14). The apparatus has means to adjust the inclination degree of the applicator nozzles (col. 12, lines 40-49).

Claim 53: The apparatus has means to detect the position of the phosphor paste (col. 7, lines 24-32).

Claim 54-55: The apparatus comprises means to recognize alignment marks that determine the positions of the ribs and grooves (i.e., spaces) so that the phosphor may be deposited in the grooves (col. 5, line 48-col. 6, line 2).

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Claim 56: Clogging of the nozzles may occur (col. 9, lines 59-62). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have included means to clean the nozzle to remove such clogs.

14. Claim 50 is rejected under 35 U.S.C. 103(a) as being unpatentable over '836 in view of '574 and Mettenbrink (U.S. Patent 4,775,080, hereafter '080).

'836 and '574 are combined as described above. '836 also teaches that the apparatus comprises pressure adjusting and controlling means to dispense the paste (col. 7, lines 48-54). '836 does not teach that the pressure may be designed to be negative. However, clogging of the nozzle is taught as disadvantageous (col. 9, lines 59-62). It is well known to prevent the formation of dried beads of material that clog nozzles by applying a vacuum to the nozzle when the dispensing stops. As an example, '080 teaches the operation of a toothpaste dispenser, in which a vacuum is formed in the nozzle that avoids the formation of a plug of hardened paste outside the nozzle (col. 8, lines 33-40). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have allowed the adjusting means of '836 to apply a negative pressure to draw undispensed material back into the nozzle at the end of dispensing in order to prevent clogging of the nozzles.

15. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over '836 in view of '080 for substantially the same reasons as given for claim 50 above.

16. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over '836 in view of Igarashi et al. (U.S. Patent 4,792,723, hereafter '723).

'836 teaches the method of claims 1 and 2 as detailed above, but does not teach the use of terpineol as the solvent for the paste. However, terpineol is a conventional paste solvent for phosphor pastes. See, for instance, '723, col. 3, line 50-col. 4, line 6. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used terpineol as the solvent of '836 with the expectation of similar results.

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17. Claims 24-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over '836 in view of '553, '231, and Mizuno et al. (U.S. Patent 5,466,325, hereafter '325).

'836 is described above. It does not teach that phosphor deposited on top of the barrier ribs are removed by an adhesive material. '553 explicitly teaches that phosphor is not desired on top of the barrier ribs of a plasma display panel (col. 12, lines 16-26). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have removed any phosphor accidentally deposited on top of the barrier ribs in the invention of '836. Further, '231 suggests the inclusion of a photosensitive material in a phosphor paste to allow photolithographic processing, as described in paragraph 11 above. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used such a photolithographic process to have removed the undesired portions of the phosphor paste. In such a case, the phosphor paste acts like the photoresist of a conventional photolithographic process.

'325 teaches the patternwise removal of photoresist material from a substrate using a pressure-sensitive adhesive. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used an adhesive to remove the undesired portion of the phosphor paste in the embodiment suggested by '836, '553, and '231 with the expectation of similar results.

18. Claim 57 is rejected under 35 U.S.C. 103(a) as being unpatentable over '836 and '574 as applied to claim 33 above, and further in view of '553.

'836 and '574 teach the limitations of claim 33, but do not explicitly teach that the apparatus includes means to remove undesired deposits of phosphor paste. '553 explicitly teaches that phosphor is not desired on top of the barrier ribs of a plasma display panel (col. 12, lines 16-26). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have removed any phosphor accidentally deposited on top of the barrier ribs in the invention of '836.

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19. Claims 45 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over '836 and '574 as applied to claim 33 above, and further in view of Silverbrook (U.S. Patent 5,850,241, hereafter '241).

'836 and '574 teach the limitations of claim 33, but do not teach that the nozzle is coated with a fluorine-based resin or amorphous carbon film. '241 teaches that ink-jet nozzles may be coated with hydrophobic films such as an amorphous carbon film (col. 38, line 66-col. 39, line 30) to prevent reaction between the nozzle and polar solvent-based inks. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a hydrophobically coated nozzle in order to deposit the paste of '836 when the desired paste uses a polar solvent as a vehicle to prevent interactions between the paste and the nozzle. '241 teaches amorphous carbon and fluorinated diamond films. The Examiner takes official notice that fluoro-resins are notoriously well-known hydrophobic coatings. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a fluorinated resin as the hydrophobic coating material with the expectation of similar results.

20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Cleveland whose telephone number is (703)308-2331. The examiner can normally be reached on Monday-Friday from 8:30 a.m. to 4:00 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck, can be reached at (703) 308-2333.



Michael Cleveland

June 19, 2000



Shrive Beck  
Supervisory Patent Examiner  
Technology Center 1700